

Chapter One

1998 - 1999

Department of Health

The Department of Health (DOH) did a major restructuring of its ambient monitoring program in 1999 with the implementation of a Quality Action Project Plan (QAPP). The QAPP guides the monitoring operations of the Clean Water Branch (CWB). The major changes in the program include the reduction in the number of stations monitored for microbiological analyses, and the elimination of all shoreline physical/chemical analyses.

The number of microbiological sampling stations is reduced based on the historic data that suggests the need for only a minimal amount of sampling. This reduction of effort provides for better use of resources in other areas.

Program emphasis has been shifted to watersheds in general, and the Water Quality Limited Segments, in particular. This information will be used to assess ambient conditions, and ultimately, prepare Total Maximum Daily Load (TMDL) submittals to EPA.

Environmental Protection Agency

EPA recently adopted a “watershed approach” to assessing waterbodies. This approach involves a comprehensive evaluation of all components which can contribute to the impairment of a waterbody.

CWB initiated its monitoring program in the Waimanalo watershed in November 1998, in a manner consistent with that used in the Ala Wai watershed. The timing was critical to ensure that the initial stages of the seasonal, rainy period were captured. Meanwhile, EPA/EPO looked to include additional participants into the study. These other participants were incorporated at various times throughout the study.

CWB is completing its involvement with the Waimanalo watershed and has already begun sampling in the third watershed, Kawa Stream.

Waimanalo Stream Study by the EPA and Department of Health

Waimanalo Stream is one of 14 waterbodies listed by Department of Health in their 1996 survey as a high priority waterbody that consistently violates water quality standards. A team of water quality experts was formed by the U.S. Environmental Protection Agency and the Department of

Health to study Waimanalo Stream. The researchers assessed the water quality of Waimanalo Stream to identify sources of sediments and nutrients (nitrogen and phosphorus) that impair the stream, and to propose land management practices, runoff controls, and other approaches to improve the health of the stream.

The work group consisted of water quality modeling consultants, scientists from the University of Hawaii, the U.S. Environmental Protection Agency, and the Clean Water Branch of the Department of Health. A computer model was developed to simulate key physical processes associated with sediment and land uses in the watershed. The model predicts sediment loading under various scenarios – differing storm conditions and post-implementation of possible management practices. The predictions will be used to determine the relative cost-effectiveness of various measures that could be taken in the watershed to reduce the sediment loading to Waimanalo Stream.

University of Hawaii researchers collected water samples and flow measurements during rain storms at several stations extending mauka to makai along Waimanalo Stream and its tributaries. Sampling began in February 1999 and continued until six storm events had been characterized. The Department of Health also collected water samples from stations in Waimanalo Stream on a regular basis, every two weeks. Samples were analyzed for nitrogen, phosphorus, and suspended sediment.

The water samples collected in Waimanalo Stream and its tributaries during storm events provided information for the computer model. The locations of the sampling sites were chosen to facilitate differentiation of land runoff characteristics from conservation, urban, and agricultural land use. Storm water samples were collected at roughly fifteen to thirty minute intervals from each location, and measurements made of water discharge rates. One of the sampling sites was installed adjacent to a U.S. Geological Survey gage house on Waimanalo Stream to collect suspended sediment samples and water to measure turbidity, conductivity, pH, temperature, dissolved oxygen, and nitrate.

The water quality information will be synthesized with other existing data on the stream's biological community and surrounding land uses to provide a complete assessment. The community will have the opportunity to review results and assist in developing recommendations to improve the stream.

Summary

EPA, as co-lead agency in this project, was asked to provide an overall summary. That summary follows below.

The following is a summary of the Waimanalo Stream study submitted by EPA/EPO.

WAIMANALO STREAM: THE TMDL PROCESS (JF Harrigan, 03/29/00)

Waimanalo Stream drains into Waimanalo Bay on the northeast (windward) coastline of the island of Oahu. This stream was nominated for possible inclusion on the EPA-required Clean Water Act Section 303(d) List of Water Quality-Limited Segments (“List”) during the public outreach phase of the Department of Health’s (DOH) biennial List review cycle, most recently completed in 1998. Subsequent assessment by DOH staff classified Waimanalo Stream as a “severely impaired” waterbody, because of high turbidity, pathogens, excessive algal growth, litter and debris in the water, channel modification, and clearing of streambank vegetation. The stream was placed on the List of impaired waters needing Total Maximum Daily Loads (TMDLs). TMDLs are defined as pollutant load limits needed to bring listed waters into compliance with water quality standards; Waimanalo Stream is currently being studied to determine if TMDLs are needed, and, if so, at what level, for nutrients (nitrogen and phosphorus) and sediments.

The Waimanalo Stream TMDL Project is the first in Hawaii for a fresh water perennial stream. It serves as a pioneering attempt to identify causes and results of stream impairment, define achievable environmental management goals to reduce water quality degradation, and begin the process of watershed restoration. A significant factor in choosing Waimanalo Stream was the prospect of community involvement due to strong community interest in issues related to water quality.

Waimanalo Stream has a median flow of approximately 3-5 cfs. The main stem of the Stream is approximately 7.5 km long and originates at the incised valleys of the precipitous “pali” (cliffs) which border the inland area behind the Waimanalo watershed. The headwaters begin in areas of groundwater input at the base of the pali, and the stream flows in a relatively straight channel to the sea at Bellows Beach on Waimanalo Bay. Several small tributary channels merge with the main stem in the upper reaches; these channels are dry or nearly so under most weather conditions.

Because so little is known about pollutant loads in Hawaii’s streams (concentration data but not flow data are usually collected), several lines of investigation were opened. Contractors were hired to collect wet weather concentration and flow data across a range of rain events of differing sizes. Wet weather methods employed included working with community volunteers to obtain “snapshot” measurements of flows and concentrations of materials such as total suspended solids (TSS) and nutrients. The DOH Clean Water Branch staff obtained concentration data for sediments and nutrients at stations along the stream length during dry weather flows (see chapter on Waimanalo Watershed: Monitoring water quality 1998-99 for dry weather data and map of all sampling stations). Automated meters were deployed in the stream for the purpose of comparing turbidity measurements to TSS measurements in order to determine if electronic turbidity (measured in NTUs) can substitute for the more expensive TSS measurements, which must be conducted in a laboratory. Preliminary water quality data from the automated meters are summarized in Table 1.

Table 1. Summary of data for some parameters measured continuously in Waimanalo Stream, February-December 1999. Note that this was a period of unusually dry weather. (Data provided by Michael Tomlinson & Eric DeCarlo)

Statistic	Temp. (C)	DO Conc. (Mg/L)	DO Sat. (%)	pH	Turbidity (NTU)
Mean	24.3	5.9	71	7.8	20.5
Maximum	37.7	15.6	203	9.9	1543
Minimum	19.1	0.1	0	7.1	-0.6
SD	3.3	3.5	45	0.7	133
Number	79302	76828	76828	79302	58614

DOH completed a biological assessment of fish populations and stream habitat characterization for Waimanalo Stream in 1998. A range of stream attributes including embeddedness, width-depth ratio, pool-riffle ratio, vegetation, and native vs introduced fish were scored for three sites in Waimanalo Stream. Scores for the Waimanalo sites, as well as reference streams that have suffered less habitat damage and harbor an intact assemblage of native fish are shown in Figure 1. The lower scores at the Waimanalo sites are primarily due to three factors: the effects of fine sediment, stream bank erosion and lack of riparian vegetation, and the presence of large numbers of introduced species.

Other ongoing studies that will be integrated with these investigations of Waimanalo Stream for the TMDL include (1) development of a numerical model that will compute sediment delivery to the stream from current land uses, and (2) preparation of a complete GIS map of existing land uses and drainage outfalls along the streambanks.

When approximately one year's worth of water quality data has been collected, DOH will draft a summary document describing whether TMDLs are needed for the pollutants, and if so, how they were estimated from available data. Although rainfall was low during the data collection phase, enough runoff was sampled to support an estimate of sediment and nutrient TMDLs. Summaries of public outreach activities will also be drafted. The TMDL documents will be public-noticed and presented in Waimanalo to seek community input. Suggestions for implementation will be compiled from responses of community members to the TMDL estimates.

Habitat destruction appears to be a significant contributing factor to build-up of sediments and nutrients in the stream channels; suggestions for habitat improvement may be important to reduce the amount of pollutants entering the stream channels from land. The approximate completion date for the Waimanalo Stream TMDL project is mid-summer, 2000.

Figure 1. Comparison of biological and habitat assessment scores for Waimanalo Stream and other reference sites in Hawaii.

